FIG. 1

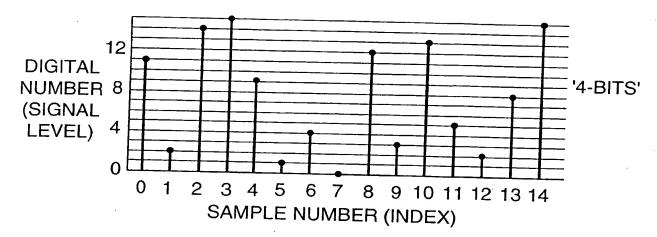


FIG. 4

COMPUTER

106

EXPOSE AND STEP



OBTAIN OR CREATE ORIGINAL DIGITAL SIGNAL OR IMAGE

ESTIMATE ROUGH OFFSET AND RMS NOISE

CHOOSE N OR N-BIT IDENTIFICATION WORD, E.G. 32

GENERATE N-BIT
IDENTIFICATION WORD

GENERATE OR SYNTHESIZE N "RANDOM" INDEPENDENT SIGNALS WITH ROUGHLY GAUSSIAN DISTRIBUTION ABOUT SOME MEAN VALUE, WHERE SIGNALS HAVE EQUAL EXTENT AND DIGITAL SPACING OF ORIGINAL DIGITAL SIGNAL OR IMAGE

APPLY DIGITAL FILTER WHICH ATTENUATES BOTH LOW AND HIGH FREQUENCIES, LEAVING MIDDLE-RANGE FREQUENCIES LARGELY INTACT

CONDENSE N RANDOM SIGNALS TO A LOWEST ACCEPTABLE BIT VALUE IF MEMORY OR STORAGE SPACE IS AT A PREMIUM

ADD ALL RANDOM IMAGES TOGETHER WHICH HAVE A CORRESPONDING '1' IN THEIR ASSOCIATED BIT-PLACE-VALUE OF THE N-BIT IDENTIFICATION WORD, CALL THIS THE BASE COMPOSITE SIGNAL OR IMAGE

EXPERIMENT VISUALLY WITH GAIN AND GAMMA APPLIED TO BASE COMPOSITE SIGNAL OR IMAGE, ADDING THIS TO ORIGINAL DIGITAL SIGNAL OR IMAGE, AND DETERMINING THE ACCEPTABLE PERCEIVED NOISE LEVEL

APPLY FOUND GAIN AND GAMMA TO BASE COMPOSITE, ADD TO ORIGINAL, THEN CALL THIS THE DISTRIBUTABLE SIGNAL OR IMAGE

STORE AWAY AND SECURE ORIGINAL SIGNAL OR IMAGE, ALONG WITH N-BIT IDENTIFICATION WORD AND THEN RANDOM SIGNALS

SELL OR DISTRIBUTE THE DISTRIBUTABLE SIGNAL OR IMAGE



OBTAIN DIGITAL OR NON-DIGITAL COPY
OF SUSPECT SIGNAL OR IMAGE

DIGITIZE IF NOT ALREADY DIGITAL

CUT AND MASK PORTION OF SIGNAL OR IMAGE BELIEVED TO BE SUSPECT (ONLY IF ENTIRE SIGNAL OR IMAGE IS NOT SUSPECT)

PROCURE ORIGINAL DIGITAL SIGNAL OR IMAGE AND CUT AND MASK TO ROUGHLY THE SAME LOCATION OR SEQUENCE

VISUALLY RESCALE AND REGISTER THE CUT-OUT SUSPECT SIGNAL TO THE CUT-OUT ORIGINAL SIGNAL

RUN THROUGH SEARCH PROGRAM WITH MEAN SQUARED ERROR AS CRITERIA AND X OFFSET, Y OFFSET, AND SCALE AS THE THREE VARIABLES

APPLY X OFFSET, Y OFFSET, AND SCALE TO CUT-OUT SUSPECT, THEN RESAMPLE ONTO EXACT GRID AND CUT-OUT OF ORIGINAL SIGNAL

RUN THROUGH SEARCH PROGRAM WITH MEAN SQUARED ERROR AS CRITERIA AND DC OFFSET, GAIN, AND GAMMA AS THE THREE VARIABLES; APPLY TO SUSPECT

SUBTRACT ORIGINAL FROM SUSPECT, GIVING DIFFERENCE SIGNAL OR IMAGE

STEP THROUGH ALL N RANDOM INDEPENDENT SIGNALS, MASKED AS ORIGINAL AND CROSS-CORRELATED WITH DIFFERENCE SIGNAL IN IMMEDIATE NEIGHBORHOOD OF REGISTRATION POINTS

FIND 0 AND 1 LEVEL BY AVERAGING FIRST FOUR 0101 CODE VALUES

ASSIGN EITHER A 0 OR A 1 TO EACH CROSS-CORRELATION RESULT DEPENDING ON PROXIMITY TO THE AVERAGES OF PREVIOUS STEP

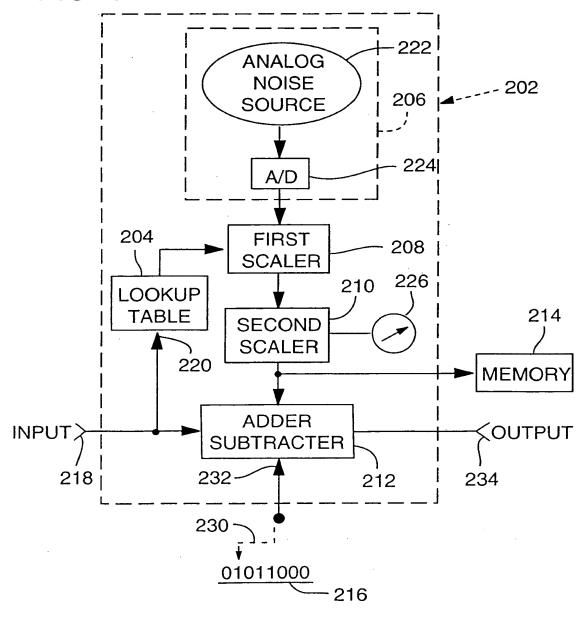
CHECK RESULT AGAINST SECURED IDENTIFICATION NUMBER

PROSECUTE IF IT MATCHES? OR AT LEAST SEND A NASTY LETTER DEMANDING RECOMPENSE

FIG. 5



FIG. 6



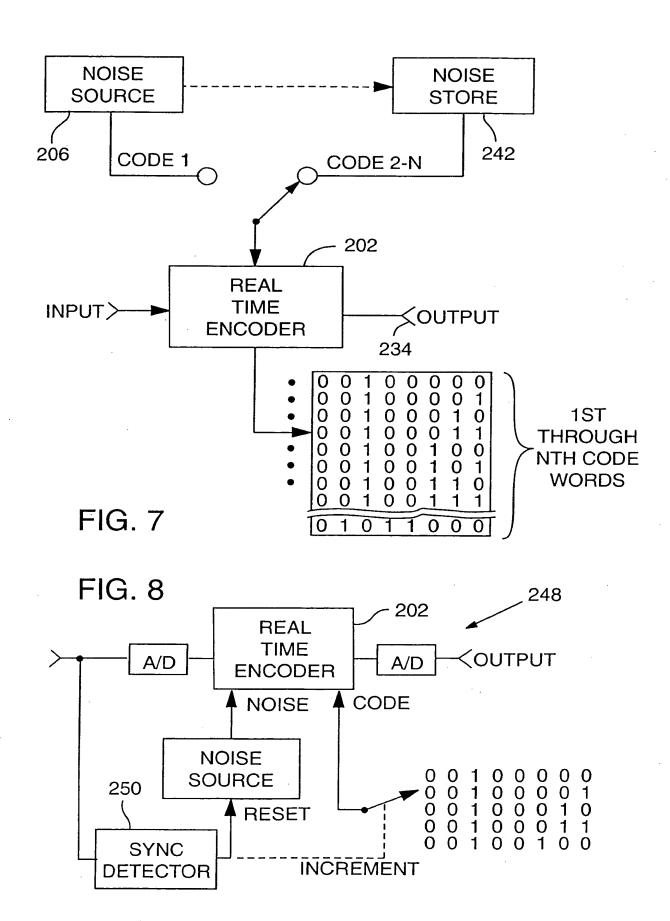
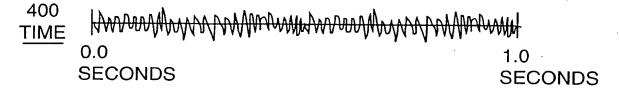
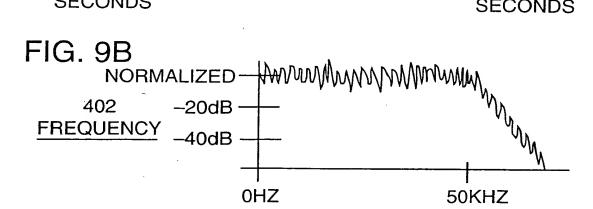
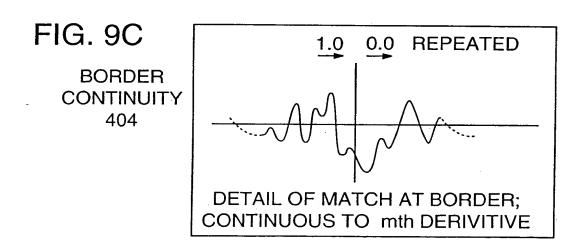


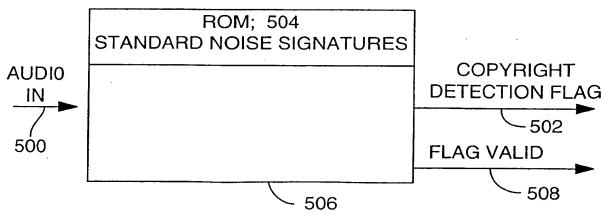
FIG. 9A











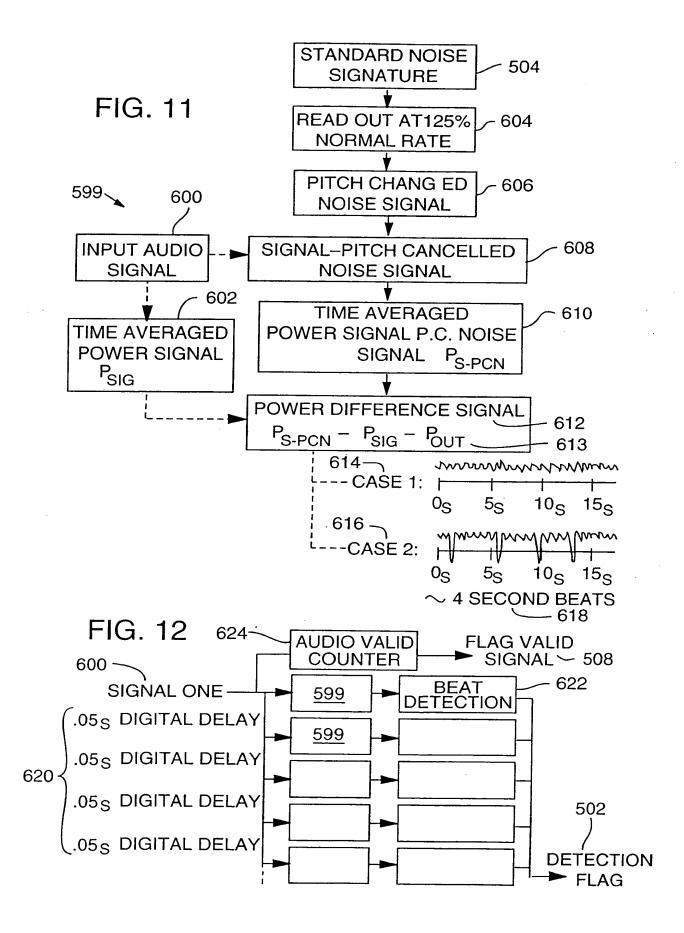
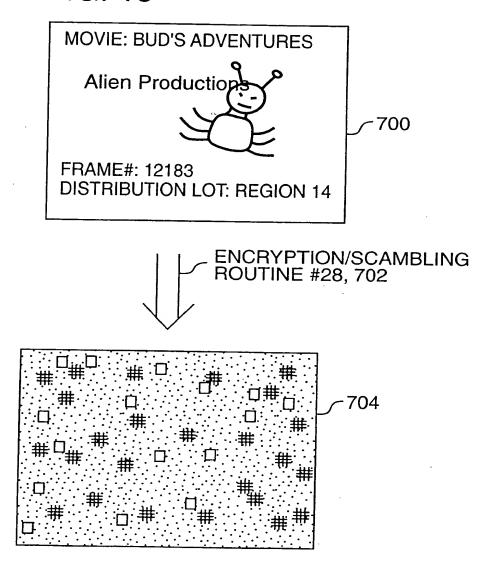
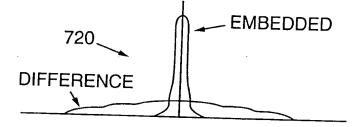


FIG. 13

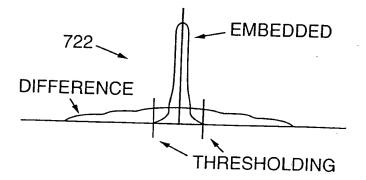


PSEUDO-RANDOM MASTER SNOWY IMAGE (SCALED DOWN AND ADDED TO FRAME 12183

FIG. 14



MEAN-REMOVED HISTOGRAMS OF DIFFERENCE SIGNAL AND KNOWN EMBEDDED CODE SIGNAL



722, MEAN-REMOVED HISTOGRAMS OF FIRST DERIVATIVES (OR SCALER GRADIENTS IN CASE OF AN IMAGE)

				JOE'S IMAGE		JOE'S IMAGE	JOE'S IMAGE	щ	JOE'S IMAGE
	01010	AM		JOE'S IMAGE					
805	001101011101001010	DATA STREAM		JOE'S IMAGE					
800	JOE'S IMAGE	HEADER	•	JOE'S IMAGE	JOE'S IMAGE	JOE'S IMAGE	JOE'S IMAGE	TO AMI PIED	JOE'S IMAGE
FIG. 16				JOE'S IMAGE		-			<u></u>

FIG. 17

96 BIT LEADER STRING, 820

"SHADOW CHANNEL", 828

64 BIT LENGTH		32 BIT DATA	DATA		
822		824		826	••••

UNIVERSAL EMPIRICAL DATA FORMAT

FIG. 18

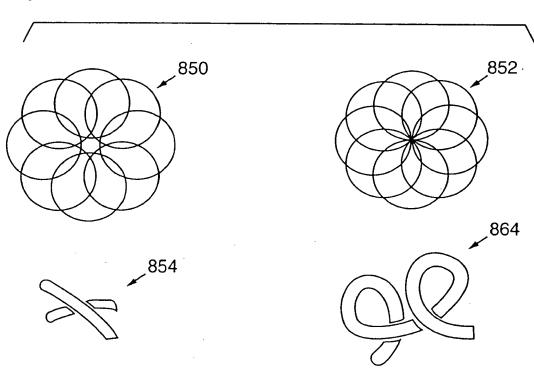
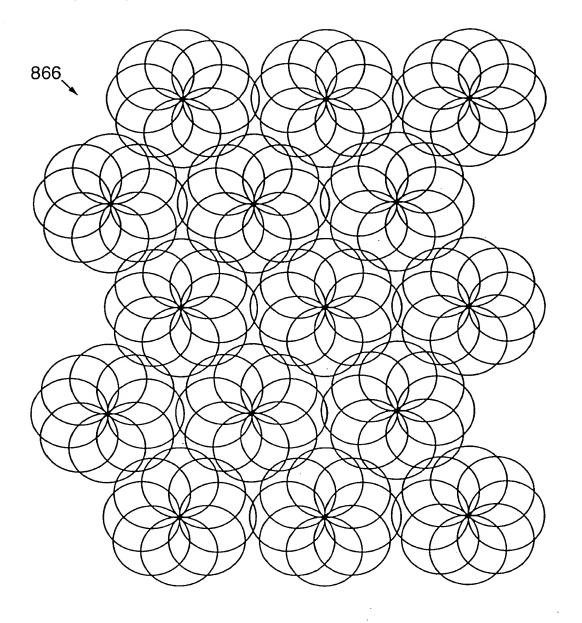


FIG. 19



QUEST FOR MOSALCED KNOT PATTERNS WHICH "COVER" AND ARE COEXTENSIVE WITH ORIGINAL IMAGE; ALL ELEMENTAL KNOT PATTERNS CAN CONVEY THE SAME INFORMATION, SUCH AS A SIGNATURE, OR EACH CAN CONVEY A NEW MESSAGE IN A STEGANOGRAPHIC SENSE

FIG. 20

874

CENTER POINT OF RING, 872



NOMINAL DISTANCE TO CENTER OF OUTER RING WIDTH, 870 NOMINAL DISTANCE TO CENTER OF OUTER RING WIDTH, 870

2-D BRIGHTNESS OF PHASE-ONLY FILTERED RING IS SIMILAR TO THE ABOVE BRIGHTNESS PATTERN ROTATED ABOUT CENTRAL POINT OF RING:

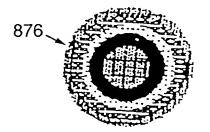


FIG. 21A

900	С	2C	С	
	2C	4C	2C	
	С	2C	С	

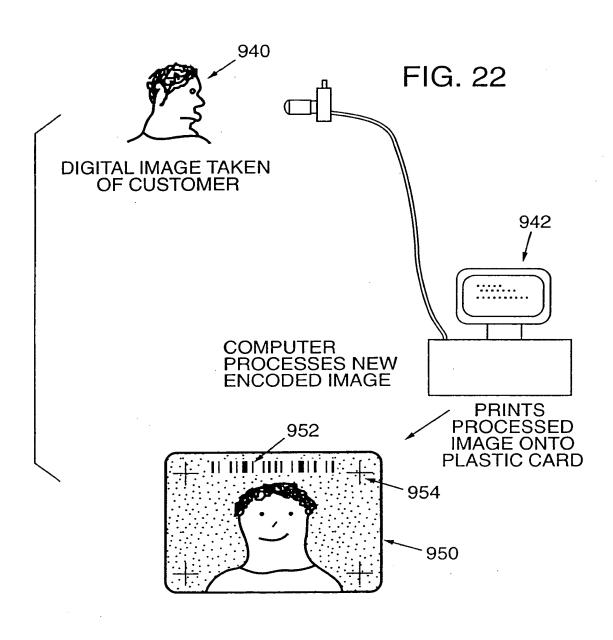
WHERE C = 1/16

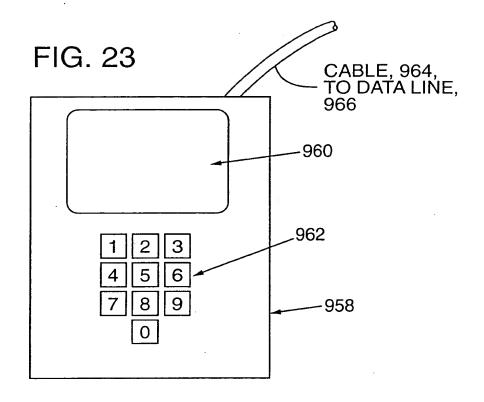
ELEMENTARY BUMP (DEFINED GROUPING OF PIXELS WITH WEIGHT VALUES)

FIG. 21B

					<u> </u>				<u>.</u>	İ	<u> </u>	ļ	<u></u>
	2	3		4		5		6		7		0	
	6	7		0		1		2		3		4	
•••					С	2C	С						
	2	3		4	2C	4C	2C	6		7		0	
					С	2C	O						
	6	7	·	0		1		2		3		4	
													•.••

EXAMPLE OF HOW MANY ELEMENTARY BUMPS, 900, WOULD BE ASSIGNED LOCATIONS IN AN IMAGE, AND THOSE LOCATIONS WOULD BE ASSOCIATED WITH A CORRESPONDING BIT PLANE IN THE N-BIT WORD, HERE TAKEN AS N=8 WITH INDEXES OF 0-7. ONE LOCATION, ASSOCIATED WITH BIT PLANE "5", HAS THE OVERLAY OF THE BUMP PROFILE DEPICTED.

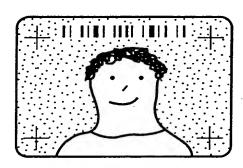




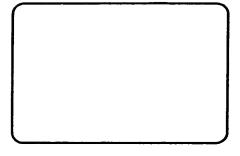
CONTAINS RUDIMENTARY OPTICAL SCANNER, MEMORY BUFFERS, COMMUNICATIONS DEVICES, AND MICROPROCESSOR

CONSUMER MERELY PLACES CARD INTO WINDOW AND CAN, AT THEIR PREARRANGED OPTION, EITHER TYPE IN A PERSONAL IDENTIFICATION NUMBER (PIN, FOR ADDED SECURITY) OR NOT. THE TRANSACTION IS APPROVED OR DISAPPROVED WITHIN SECONDS.

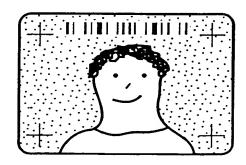
FIG. 24



ORIGINAL DIGITAL IMAGE WITH BARCODE AND FIDUCIALS ADDED, 970



COMPUTER GENERATES MASTER SNOWY IMAGE 972, WHICH IS GENERALLY ORTHOGONAL TO ORIGINAL IMAGE AT LEFT



COMBINED TO FORM PERSONAL CASH CARD, 950

MULTEDV. OVER

FIG. 25 TYPICAL TRANSACTION STEPS

- 1. READER SCANS IMAGE ON CARD, STORES IN MEMORY, EXTRACTS PERSONS ID
- 2. OPTIONAL: USER KEYS IN PIN NUMBER
- 3. READER CALLS CENTRAL ACCOUNT DATA NETWORK, HANDSHAKES
 - 4. READER SENDS ID, (PIN), MERCHANT INFORMATION, AND REQUESTED TRANSACTION AMOUNT TO CENTRAL NETWORK
- 5. CENTRAL NETWORK VERIFIES ID, PIN, MERCHANT INFO, AND ACCOUNT BALANCE
- 6. IF OK, CENTRAL NETWORK GENERATES TWENTY-FOUR SETS OF SIXTEEN DISTINCT RANDOM NUMBERS, WHERE THE RANDOM NUMBERS ARE INDEXES TO A SET OF 64K ORTHOGONAL SPATIAL PATTERNS
 - 7. CENTRAL NETWORK TRANSMITS FIRST OK, AND THE SETS OF RANDOM NUMBERS
 - 8. READER STEPS THROUGH THE TWENTY-FOUR SETS
- 8A. READER ADDS TOGETHER SET OF ORTHOGONAL PATTERNS
- 8B. READER PERFORMS DOT PRODUCT OF
- RESULTANT PATTERN AND CARD SCAN, STORES RESULT
 - 9. READER TRANSMITS THE TWENTY-FOUR
- 10. CENTRAL NETWORK CHECKS RESULTS AGAINST MASTER DOT PRODUCT RESULTS TO CENTRAL NETWORK
 - 11. CENTRAL NETWORK SENDS FINAL APPROVAL OR DENIAL
- 12. CENTRAL NETWORK DEBITS MERCHANT ACCOUNT, CREDITS CARD ACCOUNT

FIG. 26
THE NEGLIGIBLE-FRAUD CASH CARD SYSTEM

A BASIC FOUNDATION OF THE CASH CARD SYSTEM IS A 24-HOUR INFORMATION NETWORK, WHERE BOTH THE STATIONS WHICH CREATE THE PHYSICAL CASH CARDS, 950, AND THE POINT-OF-SALES, 984, ARE ALL HOOKED UP TO THE SAME NETWORK CONTINUOUSLY

